Rewarding Learning

General Certificate of Secondary Education
2012

# Science: Double Award (Non-Modular)

Paper 1
Higher Tier

**[G8404]**

**WEDNESDAY 30 MAY, AFTERNOON**

# MARK SCHEME

/ denotes alternative points
; denotes separate points
*Comments on marking points are given in italics*

| | | AVAILABLE MARKS |
|---|---|---|
| **1** | **(a)** 10; [1] | |
| | **(b)** **(i)** factor stops photosynthesis happening at maximum rate/factor that restricts the rate of photosynthesis/factor that stops reactions going faster/slows down P/S/slows down a process/factor that interferes with photosynthesis/prevents increase in photosynthesis; [1] | |
| | **(ii)** Line A – light;<br>Line B – carbon dioxide; [2] | 4 |
| **2** | **(a)** **reflex arc** (need both words) [1] | |
| | **(b)** quick(er)/protection/automatic/without thought/quick/immediate/ fast/brain [1] | |
| | **(c)** must have both arrows going from stimulus to the sensory neurone to the spinal cord, and one from the spinal cord to motor neurone (need **both** correct for [1]); [1] | |
| | **(d)** relay/association/connector/intermediate; [1] | |
| | **(e)** contract/flex; [1] | 5 |
| **3** | **(a)** (**more**) blood to skin surface/blood capillaries widen/blood flow increase/ expand (**not** move)/blood flow directed to skin surface;<br>heat lost by **radiation**; [2] | |
| | **(b)** sweat **evaporates**;<br>using heat **from body**; [2] | 4 |
| **4** | increased heart rate;<br><br>more oxygen into body/$CO_2$ out of body/more gas exchange/more air into lungs/body;<br><br>liver; [3] | 3 |

| | | | AVAILABLE MARKS |
|---|---|---|---|
| **5** | **(a)** | Any **four** from:<br>1. record distance moved;<br>2. over a set time;<br>3. do at different temperature or describe how you change temperature;<br>4. reset bubble/reset using syringe;<br>5. keep named controlled variable the same i.e. windspeed/humidity/ surface area of leaves, same plant;<br>6. repeat and average/repeat for **reliability** [4] | |
| | **(b)** | increase; more evaporation/faster evaporation/more water uptake/more transpiration/faster transpiration/more water through stomata; [2] | 6 |
| **6** | **(a)** | so that $CO_2$ is not present in the air in flask 2 before the locust produces it by respiration/so that they know any $CO_2$ is produced by insect/locust or during experiment/to see if produced by insect/in respiration; [1] | |
| | **(b)** | flask 2; clear/colourless;<br>flask 3: milky white/cloudy; [2] | |
| | **(c)** | no insect/replace with dead insect/beads/empty jar; [1] | 4 |
| **7** | **(a)** | **(i)** Type of bacteria – nitrogen fixing;<br>Source of nitrogen – nitrogen (in the air);<br>**or**<br>Type of bacteria – nitrifying bacteria;<br>Source of nitrogen – ammonia; [2] | |
| | | **(ii)** denitrifying (bacteria); [1] | |
| | **(b)** | spread slurry/brown manure/plough the plants back into the ground/ green manure/plant legumes/don't harvest crop/or leave plants/aeration/ ploughing but only with increasing nitrogen fixing/nitrifying bacteria; [1] | |
| | **(c)** | active transport/uptake; [1] | 5 |
| **8** | **(a)** | **(i)** Sun/sunlight ***not*** *light on its own* [1] | |
| | | **(ii)** vegetation → beetle → centipede → toad → fox;<br>arrows in the correct direction from the plant [2] | |
| | | **(iii)** vegetation at bottom and largest;<br>fox is the smallest and the top;<br>shape symmetrical and in order;<br>*allow consequential marking from their food chain* [3] | |
| | | **(iv)** fox [1] | |
| | **(b)** | **(i)** 850 – (85 + 300 + 250) = 850 – 635 = 215 kJ;<br>[1] for working if final answer is wrong [2] | |
| | | **(ii)** 85 kJ [1] | 10 |

AVAILABLE MARKS

**9** **(a)** **(i)** to destarch it/so that any starch present at the end was made during the experiment; [1]

**(ii)** to kill the leaf/stop chemical reactions;
(boil in) alcohol/ethanol; [2]

**(iii)** turn off Bunsen burner/use an electric water bath; [1]

**(iv)** blue/black; [1]

**(b)** **(i)** the shape doesn't match/it fits with it/enzyme is specific/lock and key/specificity/substrate is specific/enzyme specific; [1]

**(ii)** more than two glucose molecules;
joined together; [2]

**(iii)** shape of enzyme/active site is changed by heat/denatured/enzyme changed shape; [1]

**(c)** Any **two** (adaptation with corresponding explanation) from:
Adaptation – microvilli/large surface area;
Explanation – increased absorption area/for quicker/more absorption;
***not*** *easier*
**or**
Adaptation – lots of them;
Explanation – more absorption/quicker absorption;
**or**
Adaptation – thin epithelium/one cell thick/thin walls;
Explanation – short diffusion distance;
**or**
Adaptation – permeable or semi-permeable;
Explanation – to allow molecules to pass across;
**or**
Adaptation – good blood supply/blood supply close to the wall;
Explanation – maintain diffusion/concentration gradient/quick distribution around body;
**or**
Adaptation – villi can move/muscle in villi;
Explanation – to allow more glucose/products of digestion to come in contact;
**or**
Adaptation – lacteal;
Explanation – to allow absorption of fats/fatty acids and glycerol; [4]

**(d)** **(i)** hepatic portal vein; [1]
insulin; [1]
glycogen; [1]
urea; [1]

**(ii)** removed because it is **toxic**/harmful/poisonous;
removed by kidney; [2]

19

AVAILABLE MARKS

**10** **(a)** **(i)** arrow lungs to LA;
LV to aorta past split towards head and arms; [2]

**(ii)** X on LV; [1]
*must be inside the heart and below the level of the valve*

**(iii)** A – renal **artery**;
B – vena cava; [2]

**(b)** **(i)** coronary (artery); [1]

**(ii)** no oxygen/sugar (**not** just blood); no respiration/no energy; [2]

**(c)** **(i)** engulfs/surround/absorb/takes in/ingest;
digest/break down/dissolve; [2]
*if in wrong order then maximum* [1]

**(ii)** Any **two** from:
- dead/weakened dose of microbe/disease
- presence of antigen
- antigen or microbe or disease recognised by WBC
- **lymphocyte** produces antibodies [2]

***not** a small dose*

**(iii)** don't have to get sick/less disease in population/don't catch dangerous disease/long lasting/permanent/get memory cells; [1]

**(iv)** in mother's milk/by injection (**of antibodies**)/across placenta; [1] 14
***not** booster on own (unless explained), **not** vaccination*

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 11 | (a) | (i) | minerals run-off (via drainage ditch)/slurry run-off/run-off of fertiliser/ leaching/organic waste/septic tank contents/sewage; [1] | |
| | | (ii) | Any **five** from:<br>• increase in growth of algae/algae bloom<br>• algae block out light from the other underwater plants<br>• they can't photosynthesise<br>• algae and plants **die**<br>• bacteria start to **decay** algae and plants (decompose/break down)<br>• **bacteria respire and use up oxygen**;<br>• fish and other animal life die [5] | |
| | (b) | (i) | quadrat; [1] | |
| | | (ii) | identify plant species;<br>estimate percentage cover;<br>calculate average/record;<br>and repeat several times for reliability in one area;<br>repeat in the other area;<br>(Any **four**) [4]<br>*if use co-ordinates/line transect/belt transect/belt transect/throw/ random numbers*<br><br>Quality of written communication [2] | |
| | | (iii) | temperature; thermometer;<br>sun/light; light meter/LDR;<br>pH; pH meter;<br>rain/rainfall; rain gauge/measuring cylinder;<br>wind; anemometer;<br>soil moisture; moisture meter or oven – described;<br>humidity; hygrometer;<br>(Any **two** pairs) [4] | 17 |

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 12 | (a) | (i) | GG; Gg; | [2] | |
| | | (ii) | Gg and Gg parents;<br>Punnett;<br>cross correct;<br>circle around gg; | [4] | |
| | | (iii) | two Punnett squares;<br>both cross with gg (for second mark); | [2] | |
| | | (iv) | if any offspring are white (then tawny parent was heterozygous)/<br>if no white offspring it is not heterozygous (Gg); | [1] | |
| | (b) | (i) | camouflaged/hiding/blending;<br>easier to hunt/easier to escape predator (when young)/to reproduce; | [2] | |
| | | (ii) | (survival to) breed/reproduce;<br>pass on allele for gold colour/pass on genes;<br>**or** converse for white lions | [2] | |
| | (c) | (i) | isolate human gene/DNA that codes for insulin;<br>remove the plasmid (from bacterium)/from ring of DNA;<br>cut plasmid (open);<br>join plasmid and human gene;<br>put (it) back into the bacterium; | [5] | |
| | | (ii) | place in fermenter/bioreactor/tank;<br>bacteria multiply/reproduce/divide/mitosis;<br>**or**<br>bacteria multiply;<br>separation/purification/extracted/harvested; | [2] | |
| | (d) | (i) | T; *on left*<br>A; *on right*<br>*if A and T in wrong order then* [1] | [2] | |
| | | (ii) | double;<br>helix; | [2] | |
| | | (iii) | protein/polypeptide/dipeptide; | [1] | |
| | | (iv) | X-ray (diffraction/crystallography); Wilkins/Franklin;<br>3D structure/**model**; Watson/Crick;<br>complementary base pairing; Chargaff;<br>(Any **two**) | [4] | 29 |
| | | | | **Total** | **120** |